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Hiker Traffic On and Near the Habitat of Robbins Cinquefoil, an Endangered Plant Species

by

R. E. Graber and G. E. Crow

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ACKNOWLEDGEMENTS

We wish to thank Dr. Thomas D. Lee, C. Barre Hellquist and Mark J. McDonnell for their helpful comments on the manuscript. The cooperation and support of Mr. Richard W. Dyer, Office of Endangered Species, USFWS and Mr John Lanier, White Mountain National Forest, USFS is gratefully acknowledged. Special thanks is due Ms. Sherry Holmes, Mr. Robert Vinton and Mr. Douglas Ryder, undergraduate students at the University of New Hampshire who braved many hours of inclement weather to gather data for the project. Tess Feltes prepared the cover illustration and graphs.

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ABSTRACT

Outdoor recreationists have a negative impact on the last surviving colony of *Potentilla robbinsiana* Oakes. We observed hikers to determine their numbers, characteristics, time of travel and motives. Hiker traffic on and adjacent to the plant habitat was estimated at 7,535 people per year. Ten percent disregarded warning signs, left the trail, and entered the endangered plant habitat. Trespass was most common (19%) during June when many of the alpine plants were in flower. Trespass usually occurred around noon and again in the evening. Hikers without packs were more likely than those with packs to walk on the *P. robbinsiana* habitat. Approximately one-third of those entering the habitat were there to see the endangered plant. Most of the remaining two-thirds were there by chance.

KEY WORDS: Endangered plant species, rare plants, *Potentilla robbinsiana,* alpine hiker survey, Mt. Washington, NH

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Figure 1.— Robbins cinquefoil is a very rare plant which survives at a single site in the White Mountains of New Hampshire.

Hiker Traffic On and Near the Habitat of Robbins Cinquefoil, and Endangered Plant Species

by
R. E. Graber and G. E. Crow[1]

INTRODUCTION

Robbins cinquefoil *(Potentilla robbinsiana* Oakes) is one of the rarest plants of eastern United States. It is a very low, nearly stemless plant with a dense tuft or rosette of leaves (Fig. 1). Small yellow flowers open in late May and June. The plant is a long-lived perennial which grows very slowly and is unlikely to flower before 10 years of age. The oldest plants are estimated to be 40 to 60 years old.

Robbins cinquefoil grows at a single alpine location in the White Mountains of New Hampshire occupying about a quarter acre. It was never common, but small colonies of Robbins cinquefoil were known at four locations in the 1800's (Crow and Storks, 1980). All but one of these colonies have died out. They were all located on or very near trails or a road (Mt. Washington Toll Road). The impacts of human and horse traffic and the taking of specimens by plant collectors are believed to be the causes of these losses of Robbins cinquefoil (Graber, 1980). The sole surviving colony in the White Mountains has been declining and is now confined to about one-quarter of the territory it occupied in 1934 (Steele, F. L., personal communication). Robbins cinquefoil has been classified as a species in danger of extinction by the U.S. Fish and Wildlife Service (Cook, 1980).

The barren alpine habitat occupied by the Robbins cinquefoil is bisected by the heavily travelled Appalachian Trail. The trail is well marked; signs remind hikers to stay on the paths and avoid trampling fragile plant life. However, many hikers walk on the cinquefoil habitat resulting in serious consequences for the plant.

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Graber (1980) found that heavy foot traffic on the Appalachian Trail represented a major threat to the survival of Robbins cinquefoil. An unknowing hiker may step on and crush a plant, but more important, in the long term, is the shifting and dislodging of the stony surface layer, which occurs when hikers trespass on the cinquefoil habitat. The abrasion and churning caused by hikers' footsteps can eliminate the protected spaces between the individual stones, which often hold fine soil and organic matter. These minute sheltered spots are the nurseries for newly germinated Robbins cinquefoil, and it is here that they grow and survive. When the stony surface is disturbed by hikers, the soil between the stones loosens and is soon blown or washed away in severe mountain storms. Once this bit of soil is lost, there is little chance of nurturing a seedling. The trail-side zone disturbed by the hikers has widened in recent decades. The cinquefoil has died out completely on one side of the trail and is largely absent on habitat within 26 feet of the trail on the other side.

As a first step in reducing the human impact on the Robbins cinquefoil, we observed the hiker population to determine their numbers, characteristics, time of travel, and motives.

METHODS

Hiker activity was observed during the summer of 1980. A student assistant, who was out of sight, noted time, group size, direction of travel, hiker pack size, age, and especially hiker behavior on and adjacent to the cinquefoil colony. When hikers left the trail and walked on the Robbins cinquefoil habitat (trespassed), the observer determined the purpose of the visit by watching what the individual did.

To supplement these observations, three electronic pressure plate counters were placed in the trail. The counters were carefully calibrated initially and checked for accuracy frequently during the summer. They provided a total count of all foot traffic on the Appalachian Trail during the study period. The chi-square test of independence was used to evaluate the hourly, pack-class, directional, and age-class data.

RESULTS

From 15 June to 31 August, we made counts during parts of 40 days and observed 1,936 hikers. Of those observed, 194 hikers (10.02%) walked past the posted signs and trespassed on the Robbins cinquefoil habitat.

Electronic pressure plate counters were installed from 22 June to 13 September (83 days). The total count was 5,852 hikers. We assumed that the percentage of trespassers would be the same as the observed period — 10.02 percent, and estimated 586 trespassers during this period. We then estimated traffic for the entire season, which we determined as 1 May to 30 November (214 days). The projection for the entire season was 7,535 hikers with 755 trespassers. We believe this annual figure is conservative, but it is only an estimate based in part on actual counts and our knowledge of hiker-use patterns in the May to November period.

The traffic averaged about 55 hikers per day in June, increased moderately to 57 in July, and then leaped to 95 per day in August. The count dropped rapidly after Labor Day with an average of 49 hikers per day during the first 2 weeks of September. The rate of hiker trespass was highest (19.0%) during the 16 days we observed in June (flowering occurred during this period). In July and August, trespassing was 7.9 percent and 8.0 percent respectively. Only the pressure plate counters were used in September, so we have no measure of trespass during that time.

Hiker traffic varied widely from hour to hour during a typical day (Fig. 2). Our June observations showed that three travel peaks occurred at 8 to 9 a.m., 2 to 3 p.m., and 7 to 8 p.m. No trespass was noted before 10 a.m. or between 4 and 6 p.m. Travel dropped to a very low level after the first surge in the morning and then climbed steadily until early afternoon. Trespass, in both total numbers and as a percentage of all hikers, peaked just before and after noon and again in the evening at 7 to 8 p.m. These frequencies of trespass were significant ($p < 0.005$).

Approximately half of the hikers were carrying large backpacks with sleeping bags, mattresses, etc. (Fig. 3). The remainder were divided almost equally between those carrying day packs or no packs at all. The presence or abundance of a pack indicates commitment by the hiker to travel. Those with a heavy pack were often destination-oriented and reluctant to stop. Those with light or no packs were traveling leisurely, even aimlessly, with no definite objective or an easily reached goal. Some possible reasons for hikers without a pack include: someone else is carrying their gear, they are staying at the nearby Lakes of the Clouds hut, or they have walked down from the Auto Road for a brief hike. Those without packs trespassed 5 times more than those with a heavy backpack. Hikers equipped only with a day pack trespassed 3 times more than those with a heavy backpack. The frequency of trespass by the three hiker pack classes differed significantly ($p < 0.005$).

Direction of travel was related to frequency of trespass. Travelers from the south were coming from the direction of Crawford Notch,

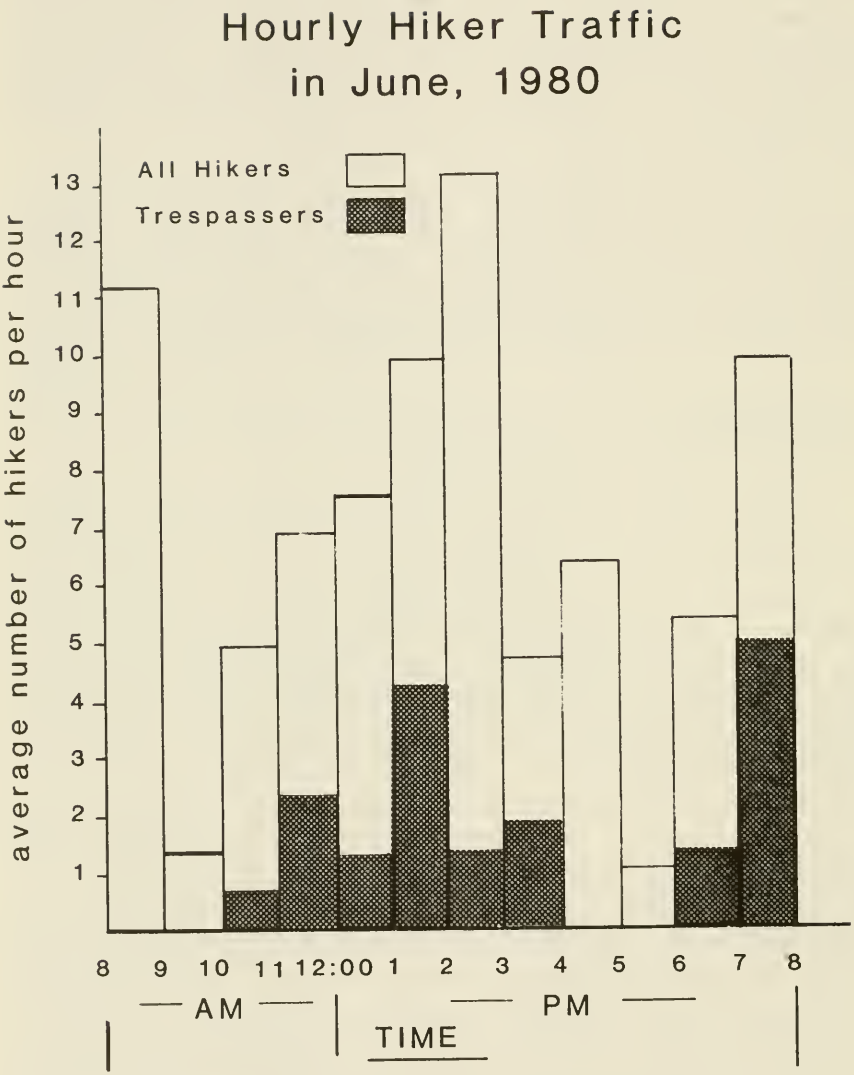

Figure 2.— Hourly hiker traffic in June, 1980.

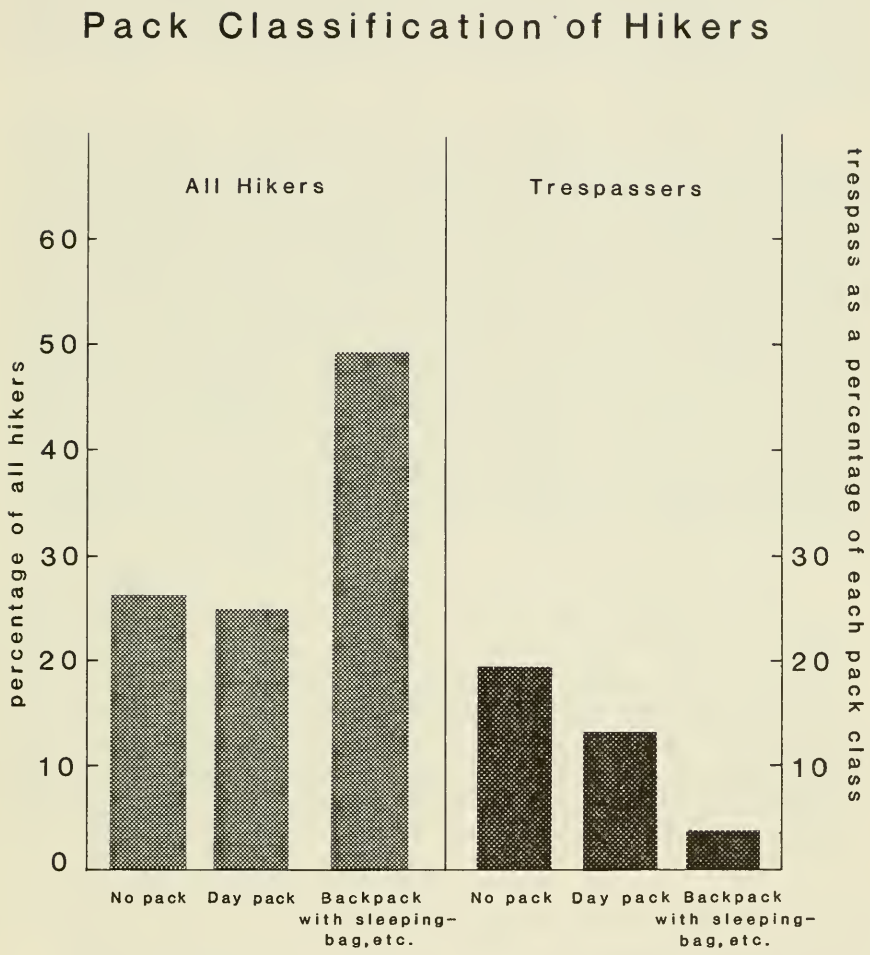

Figure 3.— Pack classification of hikers.

and those from the north were coming from Mt. Washington and nearby Lakes of the Clouds (Fig. 4). More hikers came from the south on the Appalachian Trail (59.0%) than in any other direction. But, hikers coming from the north (38.8%) trespassed 4 times more than those coming from the south. Those from the north seemed to have more time and interest in wandering about. The classification "other" was applied to hikers (2.2%) on two closed trial segments, both of which lead directly into the Robbins cinquefoil habitat. The rates of trespass among the three classes differed significantly ($p < 0.0005$).

Hiker age is an inexact classification. We estimated age by observing physical activity, facial characteristics, etc. and classified individuals as children, teenagers, young adults, middle adults, and older adults. We found that young adults are by far the largest class of hikers (55.4%), and middle-aged adults were a distant second (24.0%) (Fig. 5). Children and teenagers were 9.1 percent and 8.2 percent, respectively, and older adults represented only 3.3 percent of the hiker population. Teenagers had the lowest trespass percentage (5.1%), and children and older adults had the highest (13.6% and 13.8%). These differences were significant ($p < 0.005$). Trespass by children seemed to be related to an abundance of energy and less discipline than other hikers. Many older adults seemed to be plant lovers who were aware of Robbins cinquefoil and wanted to physically observe, study, or photograph it.

Reasons or motives for hiker trespass varied widely (Fig. 6). The largest single group was there to see the Robbins cinquefoil (30.4%). An additional 4.1 percent had a specific interest in the physical habitat or other plants growing there. Thus, roughly one-third of the trespassers were there deliberately to view or enjoy Robbins cinquefoil and other unique aspects of the habitat. However, nearly two-thirds of all trespassers were present by accident or fate, because they happened onto the habitat as they walked on the Appalachian Trail.

DISCUSSION

With this study completed, we now have an estimate of the total hiker population (7,535) at and trespassing (755) on the Robbins cinquefoil habitat. We know one-third of the trespassers are plant lovers and that in June around noon or in the evening they are most likely to be there.

We have a rough profile of typical trespassers: they travel from the north without a pack. If it is June and the hiker is an older adult, there is a 75 percent chance that trespass will occur. In June, 51

percent of all hikers traveling from the north without a pack do trespass.

A disproportionate number of trespassers came from the north. Many of these people were staying at the Appalachian Mountain Club hut at Lakes of the Clouds which is only .3 miles to the north. Additional day hikers came down from the sumit of Mt. Washington about 1.7 miles away. These hikers represent a significant part of the problem; they also allow us to target a very specific group and one that is readily approachable. This knowledge enables us to concentrate information and education programs on specific populations or interest groups.

Because of the serious decline of Robbins cinquefoil, the current trespass figure of 755 hikers is excessive. We doubt that the plant can survive this level of visitation. If the long term stability and survival of Robbins cinquefoil is the objective, the number of trespassers must be reduced substantially. This could be accomplished by actions such as: relocating the trail, posting a nature interpreter nearby to direct people away from the critical habitat, and by providing a transplant colony of the plant for those with an interest in observing it. But even if foot traffic is lowered dramatically, it will be necessary to closely monitor the cinquefoil population. If the endangered Robbins cinquefoil colony continues to decline, more restrictive measures will be required (Crow & Graber, 1981; Crow, in press).

LITERATURE CITED

Cook, R. S. 1980. Determination of *Potentilla robbinsiana* to an endangered species with critical habitat. Federal Register 45(182): 61944-61947.

Crow, G. E. in press. New England's Rare, Threatened, and Endangered Plants. USFWS. U.S. Government Printing Office, Washington, D.C.

Crow, G. E.; Storks, I. M. 1980. Rare and endangered plants of New Hampshire: a phytogeographic viewpoint. Rhodora 82:173-189.

Crow, G. E.; Graber, R. E. 1980. Survey of hiker activity and mapping of critical habitat of *Potentilla robbinsiana.* Unpublished report prepared for the White Mountain National Forest and the U.S. Fish and Wildlife Service, Office of Endangered Species.

Graber, R. E. 1980. The life history and ecology of *Potentilla robbinsiana.* Rhodora 82:131-140.

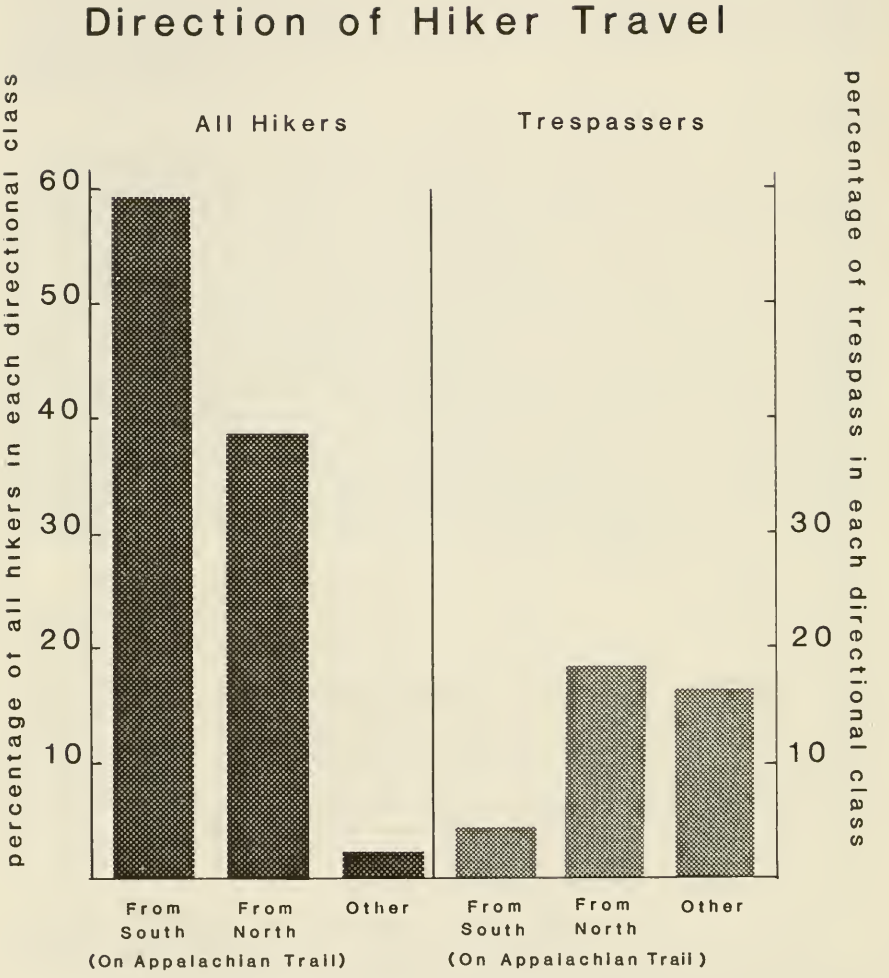

Figure 4.— Direction of hiker travel.

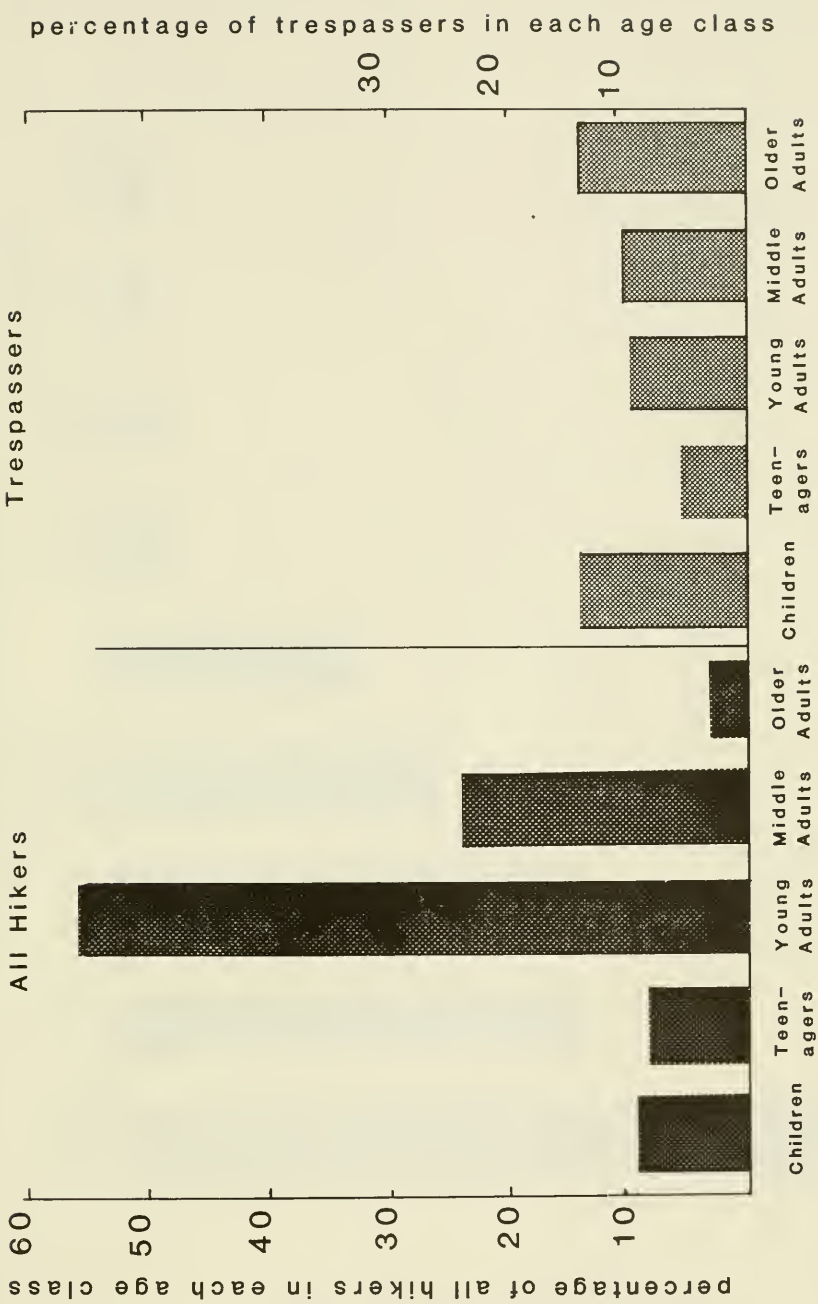

Figure 5.—Hiker age profile.

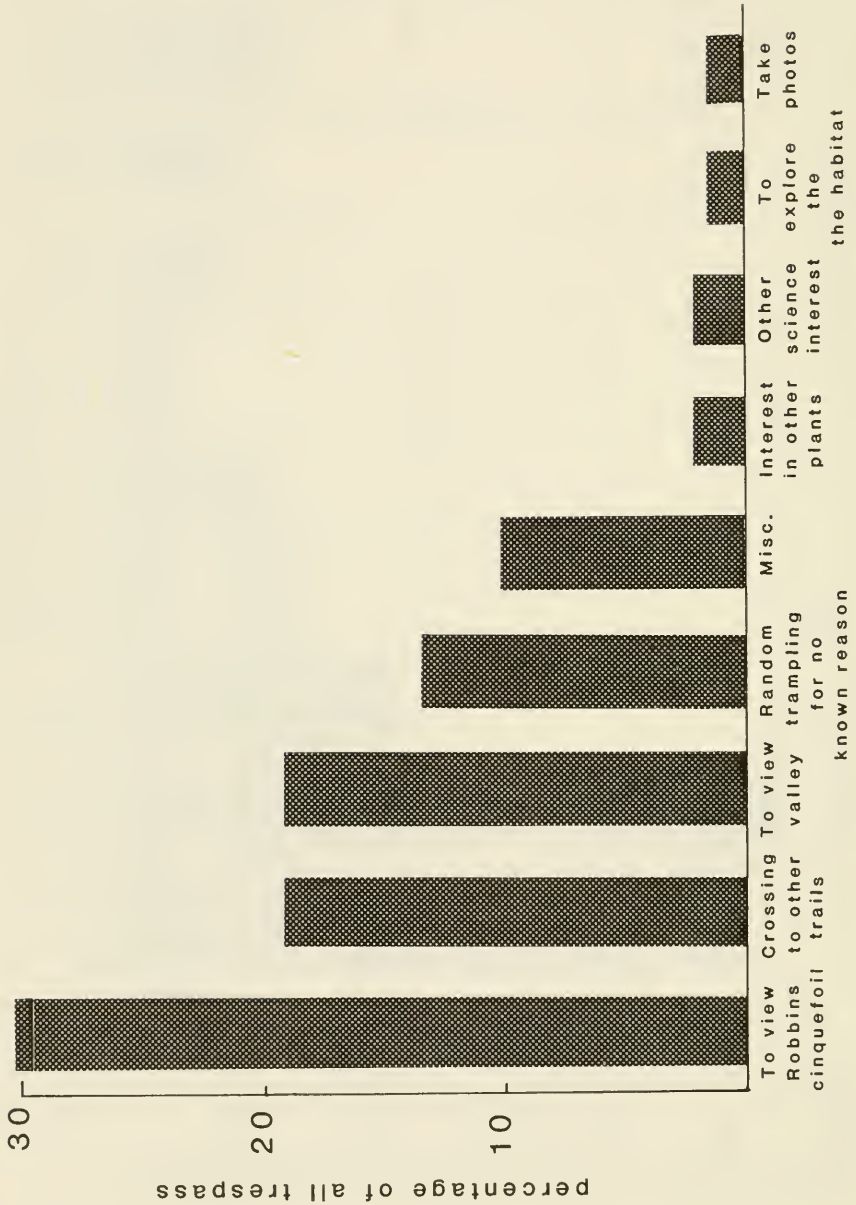

Figure 6.— Reasons for hiker trespass.